PREPARATION FOR AIRLIFT



UMODD04

TBOLC 500-500-

115

Objective



 Know the pertinent procedures/requirements and be able to successfully deploy your unit by air

References

DOD 4500.0-R, DTR, Part III, Mobility

FM 55-9, Unit Air Movement Planning

FM 3-35.4, Deployment Fort-to-Port

FORSCOM/ARNG Reg 55-1, Unit Movement Planning

<u>Outline</u>

- Unit Preparation for Air Movement
- Preparing Personnel for Air Movement
- Equipment Preparation and Joint Inspection
- Center of Balance



Unit Preparation for Air Movement



<u> UMO - General Responsibilities</u>

• <u>UMO:</u>

Coordinates unit airlift planning and preparation activities

- Includes coordination with higher headquarters & UMC for unit support & procedures during movement to and processing at APOE.
- Primary objective is to minimize the time a unit being moved is nonoperational

<u>Deployment Box</u>

Manuals / CD's

Measuring tape

Duct tape

Grease pencils

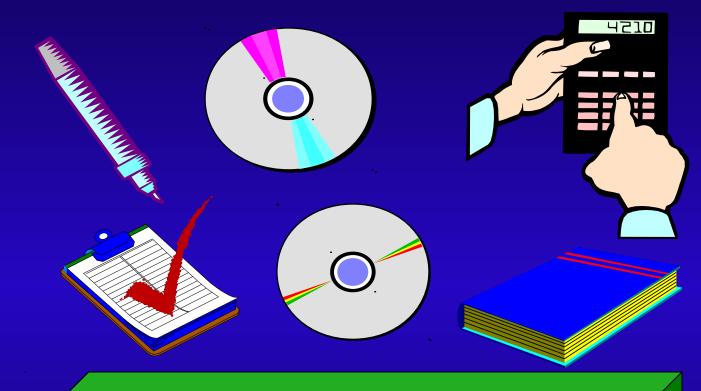
Calculators

Chalk

Pallet Cards

Pallet Bags

DD 2131 / 2133 TB 55-46-1



DEPLOYMENT BOX

<u>UMO/Unit Preparation Tasks</u>

- Identify the number of personnel and type and quantity of cargo and equipment to be moved by air
- Prepare/review air movement plan with higher HQ. Plan should detail unit actions and include sequence of movement for troops & equipment
- Establishing unit priorities/sequence for arriving at APOD or area of operations
- Establish liaison with supporting agencies
- Identify the cargo or equipment that requires special handling based on shipping configuration or fragile/hazardous characteristics
- Request technical assistance to prepare equipment and train personnel available from higher HQ, installation UMC, A/DACG & CRE [Air Force] (if required)

<u>UMO/Unit Preparation Tasks (cont)</u>

- Plan and coordinate required administrative support, unit movement training, air movement planning, logistics and maintenance support, and prepare briefs for deploying personnel on standard safety practices in and around aircraft
- Assign unit movement or embarkation officer
- Plan movement to POE (convoy, rail, water, commercial truck)
- Establish trained load teams to assist the A/DACG
- Identify foreign border clearance requirements (if applicable)
- Enter force deployment requirements into TC-ACCIS/TC-AIMS II (DEL/UDL) to accurately reflect lift requirements and deployment priorities
- Determine requirements for vehicle cargo restraint devices

<u>UMO/Unit Preparation Tasks (cont)</u>

- Review inspection procedures and documentation requirements for hazardous cargo
- Preparing & organizing soldiers for air movement (Includes designating key personnel, determining procedures for transportation of individual weapons and equipment procedures, aircraft safety & manifesting)
- Obtain BBPCT and determine aircraft shoring requirements, ensuring its availability before loading and establish destination disposition procedures
- Determining 463L pallets requirements (including net sets, plastic pallet covers and dunnage)

<u>UMO/Unit Preparation Tasks (cont)</u>

- Prepare movement documentation (vehicle load plans, DEL) - consider secondary cargo and hazardous or sensitive cargo/equipment
- Preparing equipment & cargo to include 463L pallet & vehicle loads (Includes configuring equipment for air movement and weighing vehicles and marking center of balance) IAW DOD 4500.9 (Defense Transportation Regulations)
- Identify support requirements (MHE, scales, prime movers etc to the DACG)

DACG Preparation Tasks

- Determine the number of personnel and type and quantity of cargo to be moved
- Determine the timeframe for loading
- Confirm the location or airfield(s) and marshaling area(s) with the installation or base commander and the deploying unit
- Determine available APOE logistic and administrative facilities
- Determine user support facilities (MHE, security, lighting, fuels, etc)
- Establish liaison with the deploying unit and other support activities

DACG Preparation Tasks

- Coordinate with the CRE to establish DACG training requirements
- Coordinate foreign border clearance requirements and procedures (if necessary)
- Obtain DEL/UDL of unit cargo and equipment to be loaded. Identify any problems that will affect loading or require special attention to the CRE
- Validate shoring requirements
- Ensure 463L pallet dunnage availability

Preparing Personnel for Air Movement



Soldier Readiness Program

- Personal readiness
 - Legal (will, power of attorney)
 - Financial (pay, credit cards, rent, car payments)
 - Medical / dental
 - ID card and tags / etc.
 - Individu



Preparing Personnel for Air Movement

- Identify key unit personnel and assign duties & responsibilities
- Key positions include:
 - **Unit liaison to A/DACG:**
 - Facilitates communication between unit and A/DACG
 - Clarifies processing procedures and resolves problems

Planeload or troop commander:

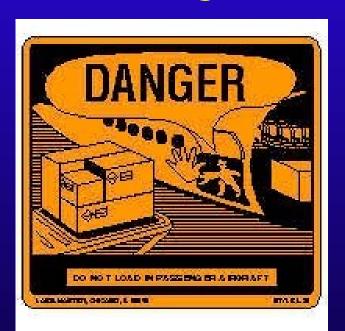
- Assumes control of all passengers listed for movement on the flight
- Ensures passengers are briefed on aircraft procedures
- Ensures necessary support is provided during enroute stops

Preparing Personnel for Air Movement (cont)

Training:

Unit vehicle drivers & equipment operators may require training in aircraft loading & off-loading and proper procedures for restraining unit cargo (under aircraft load master supervision)

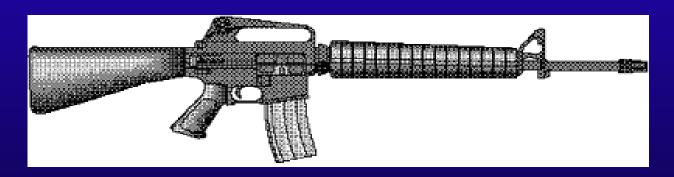
Personnel preparing hazardous cargo for air movement require training & certification



<u>Preparing Personnel for Air Movement (cont)</u>

Individual Weapons:

- Develop and brief individual weapons & ammunition procedures for airlift ops
- Reference TM 38-250 for instructions on packing & certification of ammunition
- Weapons should be "cleared" before boarding aircraft
- Personnel requiring loaded weapons must be identified to aircraft commander

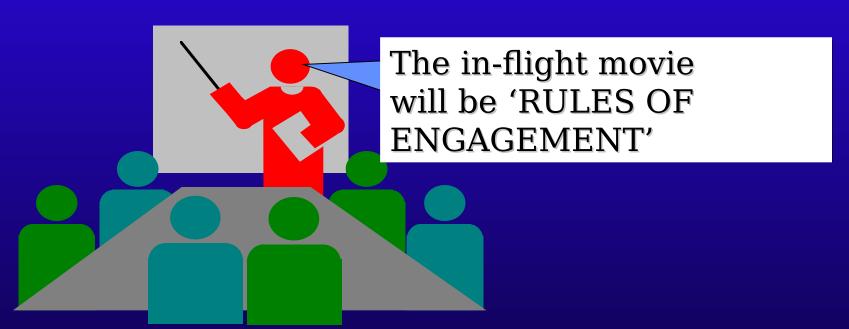


Preparing Personnel for Air Movement (cont)

Brief Personnel:

Briefing should provide a basic understanding of in-flight responsibilities and procedures for disembarking aircraft.

Briefing should include identification of key personnel (troop commander, load master)





Overview of Equipment Preparation

- Responsibilities
- Inspection Procedures
- DD Form 2133



Preparing Equipment and Cargo for Air Movement

References for equipment preparation include:

FORSCOM/ARNG 55-1, Unit Movement Planning

FM 55-9, Unit Air Movement Planning, Appendix B

DD Form 2133, Joint Airlift Inspection Record



Joint Inspection Process

 Ensures that personnel, vehicles, supplies and equipment are airlifted safely

Two steps

Prepare vehicles, supplies and equipment

for the Joint Inspection

• The actual inspection



<u>Responsibilities</u>

 All equipment must be properly prepared and documented before it can be loaded on any aircraft



<u>Responsibilities</u>

CRE or MST

- Responsible for approving all aircraft loads
- Supervising the loading/off loading and tie down of vehicles and cargo
- Assuring compliance with applicable aircraft loading manuals

Transported Unit

- Responsible for setting up the movement precedence, cargo preparation and troop management
- Preparing the documentation and on and off loading and restraining all cargo aboard AMC aircraft

<u>Responsibilities</u>

Joint

- Accomplish and document final joint inspections
- Qualified representatives from the moving unit, DACG/MCC, and the supporting airlift representative will perform the inspection
- The aircraft loadmaster or boom operator can conduct the final inspection



Joint Inspection Procedures

- Qualified Air Force and transported unit representatives will conduct final inspections
- The completed form will indicate inspections are complete
- No "Before Loading Inspection" is required by the aircrew; if all noted discrepancies are corrected before loading
- HAZMAT certifier for transported unit must be present during the inspection

Joint Inspection Form

- **DD Form 2133** is used as the **final joint inspection** document (example form at FM 3-35.4, p.K-3)
- Three copies are completed for each aircraft load and signed by representatives of the transported force and the supporting airlift personnel
- 1) Attach the original signed copy to the aircraft cargo manifest 2) CRE or MST/DACG/MCC will keep one copy for station 3) Transported force will keep one copy

1. UNIT BEING AIRLIFTED	JOINT AIRLIFT INSPECTION RECORD (See Instructions on back.)								PAGE			
		2. DEPARTURE AIRFIELD								3. DATE (YYYY)		
4. AIRCRAFT TYPE AND MISSION NUMBER		LOAD/CHALK NO. 6. START T				TIME	7. C	OMPLET	E TIME	8. TALCE/CDF		
LEGEND (Mark blocks after each item as follows)				INCI	REMENT/S	ERIAL/BUP	APER NU	MBER AN	ID TYPE	_		
✓ = SATISFACTORY												1
X = UNSATISFACTORY IF NOT APPLICABLE, LEAVE BLANK												
A. DOCUMENTATION	_		_	-						_		
9. MANIFESTS/LOAD PLANS												۲
10. SHIPPERS DECLARATION			+-			_						t
11. HAZARDOUS MATERIALS PREPARATION			-	_								t
12. LOAD LISTS/CARGO TRANSFER FORMS			-									1
B. VEHICLES/NON-POWERED EQUIPMENT												ı
13. CLEAN												
14. FLUID LEAKS												1
15. MECHANICAL CONDITION												Ц
a. ENGINE RUNS			-	-					_	-		4
b. BRAKES OPERATIONAL	_		_	-					_	_		4
16. BATTERY a. SECURE - NO LEAKS												4
b. POST/CABLES-PROTECTED			-	-	_	_			_	_		+
17. FUEL TANK(S) LEVELS												ł
a. AS REQUIRED												1
b. FUEL TANK CAPS INSTALLED			1									†
18. JERRY CANS												ı
a. DOT 5L (Metal)												j
b. POP (Plastic)												1
19. DIMENSIONS (Fits A/C Profile or Contour)	_			_								1
20. CENTER OF BALANCE (Both Sides)			_	_								4
21. SCALE WEIGHT (Both Sides)	_		-	-	_				_	-	_	4
22. AXLE WEIGHTS (Both Sides) 23. TIEDOWN POINTS (Serviceable)	_	_	-	-	_			_	-	-	-	4
24. PINTLE HOOKS/CLEVISES			_									ł
a. SERVICEABLE			_									Ŧ
b. SAFETY PIN ATTACHED (Safety Chains)			-									+
25. VEHICLE EQUIPMENT SECURE (Tools, tires, etc.)			-									†
26. TIRE PRESSURE												1
27. SHORING (Rolling, Parking, Sleeper, Approach)			_									Ť
28. ACCOMPANYING LOAD												I
a. WITHIN VEHICLE RATED CAPACITY												1
b. SECURE TO VEHICLE			-	-								4
29. LOX/NITROGEN CART (Vent Kit) C. PALLETS/PALLET TRAINS			_	_		_						+
30. CLEAN												4
31. SCALE WEIGHT	_	_	+	-	_	_			_	_	-	+
32. DIMENSIONS (Fits A/C Profile or Contour)			+-	_		_						+
33. CARGO PROPERLY SECURED			_									t
a. NETTED			_									Ť
b. CHAINED/STRAPPED			_									Ť
34. DUNNAGE (3 Pieces Per Pallet)												T
D. HELICOPTERS (Flyaway)												1
35. FUEL QUANTITY (Gellons)												1
36. BATTERY (Disconnected/Taped)			_	_								4
37. CENTER OF BALANCE (Both Sides)	_		-	-	_					-		4
38. SCALE WEIGHT (Both Sides) 39. SHORING (Rolling, Parking, Approach)	_	_	-	-				-	_	-		+
	_	_	_	-	_				_	_	-	4

General Guidelines

- Vehicles and equipment should be prepared so as not to diminish their combat capability. They should not be reduced greater than that required to meet the dimensional and weight restrictions of the aircraft transporting them.
- General cargo can be carried in or on any vehicle if the cargo can be properly secured and restrained.
- Supplies and equipment not transported as secondary loads should be palletized.
- Internal airlift/helicopter slingable units (ISU) are certified for air transportation. The keys to the containers must be available throughout the deployment process. Hazardous materials must be accessible at all times when containerized.
- 463L pallets are certified for airlift to a maximum of 10,000 pounds weight. There are various height restrictions, according to the pallet's position within the aircraft.

DD Form 2133 (Joint Airlift Inspection Record)



Use as a guide when preparing equipment and cargo for

<u>DD Form 2133 - Heading</u>

- Page ___ of ___ Pages
 - 1. Unit Being Airlifted (numerical designation and geographic location of the deploying unit)
 - 2. Departure Airfield
 - 3. Date (YYYYMMDD) of inspection
 - 4. Aircraft Type and Mission Number
 - 5. Load/ Chalk Number
 - 6. Start Time: of inspection (local)
 - 7. Complete Time: of inspection (local) load ready for movement
 - 8. CRE / CDF (Cargo Deployment Function) numerical designator

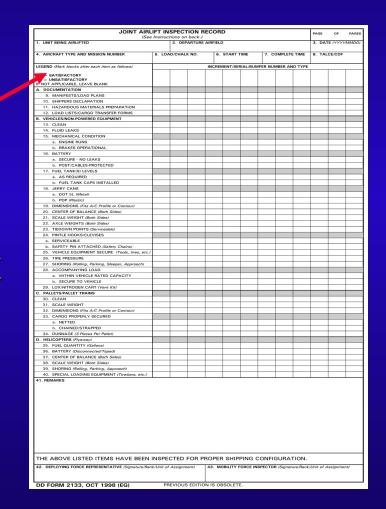
JOINT AIRL (See	PAGE	OF	PAGES					
1. UNIT BEING AIRLIFTED 7th Trans Gp, Ft Eustis, V	A	2. DEPARTURE AIRF	TELD	Langle	y AFB, VA	3. DATI	030 030	им <i>оо)</i> 115
4. AIRCRAFT TYPE AND MISSION NUMBER C17 015/03		.d/chalk no. 05/07	6. ST. 1	ART TIME . 005	7. COMPLETE TIME 1430	8. TALC 15	CE/CDF	CS

DD Form 2133 - Legend

✓ = Satisfactory

X = Unsatisfactory

If Not Applicable, Leave Blank



<u>DD Form 2133 -</u> <u>Increment/Serial/Bumper Type</u>

- Each item has its own column
- TCN's (Transportation Control Numbers) will be used to identify each individual item

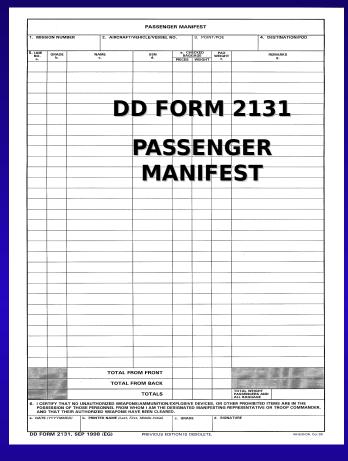
LEGEND (Mark blocks after each item as follows)	INCREMENT/SERIAL/BUMPER NUMBER AND TYPE												
✓ = SATISFACTORY X = UNSATISFACTORY IF NOT APPLICABLE, LEAVE BLANK													

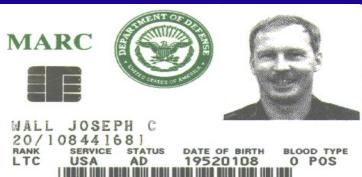
DD Form 2133 - Section A: Documentation

Item 9.

Manifests (**DD FORM 2131**)
Loadplans (**DD FORM 2130 series**)

- 7 for CONUS / 15 for OCONUS moves
- Check for proper manifesting of the entire chalk, and check that the load plane scale weights match the manifest weights
- Zero defects 100% accountability
- Ensure the load is correctly sequenced (IAW manifest) and compiles with all aircraft loading and safety of flights limitations
- ID card for accountability

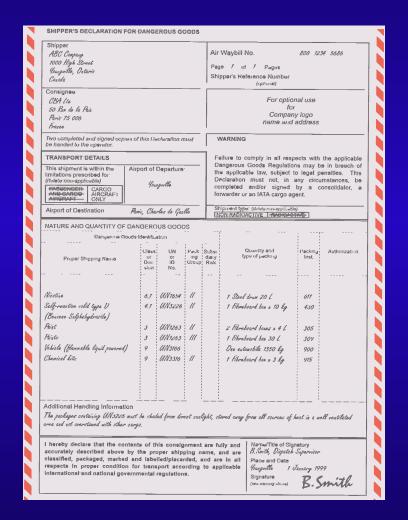




DD Form 2133 - Section A: Documentation (Cont)

Item 10. Shipper's Declaration for Dangerous Goods

Check for proper preparation of all required hazardous material documentation and certification



DD Form 2133 - Section A: Documentation (Cont)

- Item 11. Hazardous Materials Preparation check that all hazardous cargo in vehicles or as secondary loads is properly prepared, position and compatible with other hazardous material in the chalk as determined in TM 38-250
- Item 12. Load Lists / Cargo Transfer Forms: a list of items shipped must be included - ensure proper preparation of all required load lists and/or custodial transfer documentation

DD Form 2133 - Section A: Documentation (Cont)

 Maintain a Vehicle Load Card (FORSCOM Form 285-R or DA Form 5748-R) for each cargocarrying vehicle

VEHICLE LOAD CARD													
UNT/UC	V		N	NOMENYMODNO		SEC/PLT ASG	SEC/PLT ASGD		SHPMENT UNT NO		DATECOMPILED		
OPERATIONAL LENG	THOFVEH PEDUCED OPERATION		PERATIONAL	WIDTH OF VEH L REDUCED		OPERATIONAL	PERATIONAL RED.		THE VEH		ÉMPTY WIT		
LENGTH	CARGOAREA HEIGHT					OPERATIONAL	CA OPERATIONAL		RGOAREA CUBIC FT REDUCED				
NOT COMPUTED FOR HS TOMS					TEST LOAD	VERIFIEDBY	RIREDBY				DATE	4	
Œ/ŒIS	INCHES FROM												
				CAR	GOCOMPARTM	ENT MEW						7	
											TROW OF VEHICLE	E DON'	
											9	2	
											5		
									1			-	
CARGOLOCNO	CARGO	DESCRIPTION	& TYPEPACK		NOOF ITTEMS	PCCUBICFT	TOTALO	UBICFT	PC	CWT	TOTALWIT		
												1	
												1	
												4	
												1	
LOADPLLS VEHOL	EWT					TDA/MTŒPARA.	ANDLIN N	OCF DRIV	ER			$\frac{1}{2}$	
FORSCOM		D 734	··· 00			NOE1AUG80M	A)/D=::-				5-1/2X8-1/2		

<u>DD Form 2133 - Section B: Vehicles / Non-Powered Equipment</u>

- Item 13: Clean
 - No dirt, trash or pests
 - Clean each item of grime, oil, dirt etc
 - Stream clean if necessary

Clean all vehicle tires of rocks/pebbles embedded in the

treads

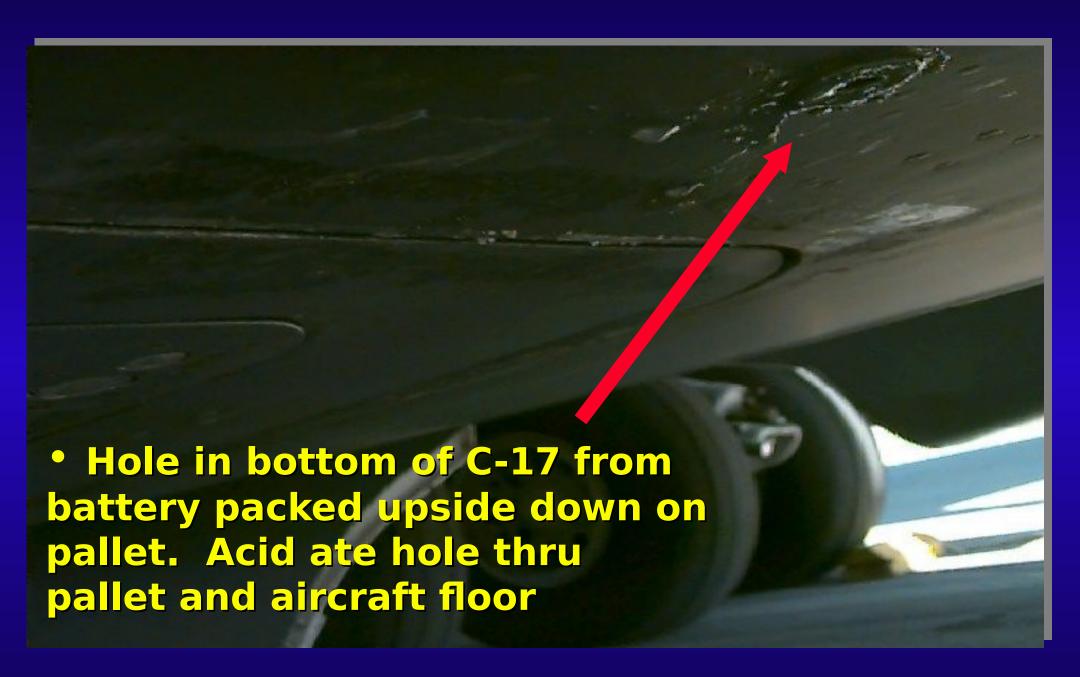




- Item 14: Fluid Leaks
 - Five drops or more per minute from a cooling system, crank case, or gear case is a leak - NO GO
 - Fuel or brake system leaks, no matter how minor, will prevent air shipment - NO GO
 - Do not consider a damp or discolored seal a leak unless any of the above conditions exist



- Item 15: Mechanical Condition
 - 15A Engine Runs: Unless a vehicle is shipped as retrograde cargo it must be operational
 - 15B Brakes Operational: Check that engine brakes and emergency brakes operate
- Item 16: Battery
 - 16A Secure no leaks: Ensure battery is correctly installed. Ensure holding clamp is secure, filler caps tightly installed. Battery connectors are tight and all cables/clamps are not in contact with any grounding point during loading or flight
 - 16B Post/Cables-Protected: To secure the battery from short circuit, completely protect the terminal posts from contact (disconnect if necessary)
 - If disconnected ensure terminals are covered wit covers or tape to prevent damage and short circ



- Item 17: Fuel Tank (s) Levels
 - Vehicles and self-propelled units will not exceed ¾ of a tank when positioned on the cargo floor or ½ a tank when positioned on the cargo ramp of the C-130, C-17, and C-5
 - Vehicles and self-propelled units may be filled with fuel not to exceed ½ full when loaded on the KC-10 and the KC-135
 - Equipment that is ramp loaded will be positioned with the gas tank opening on the high side of the ramp
 - Wheeled engine-powered support equipment (such as wheeled generators) will not exceed ½ tank regardless of aircraft or position on the aircraft
 - Palletized vehicles or self-propelled equipment will not exceed ½ of a tank. Palletized generators will be drained. ⁴²/₄₂ exceed ½ of a tank. Palletized generators will be drained.



Fuel Tank Levels (cont)



Vehicles and self propelled units: 3/4 full on cargo floor ½ full on



Vehicles and self propelled units: 1/2 full anywhere on aircraft

Fuel Levels (cont)

• Single axle units disconnected from its prime mover and loaded with its tongue resting on the aircraft floor or ramp must be drained, but need not be purged (up to 500 ml [17 ounces] of fuel may be left in engine components and fuel lines)



DD Form 2133 - Section B: Vehicles / Non-Powered Equipment (cont)

Item 17b - Fuel Tank(s) Caps Installed



- Item 18: Jerrycans
 - **18A**: DOT 5L (Metal)
 - Authorized for transporting flammable liquid fuel stocks
 - Combined with fuel shipped in vehicle tanks do not exceed two full tanks supply
 - Must be secured in approved storage racks designed to prevent movement or leakage during airlift
 - Must be serviceable ie serviceable gasket in place on the screw gap closure, no leakage or dents in seams
 - Can only be palletized when drained (purging not required)
 - No minimum fuel requirement 5 gallons maximum (measured to the weld bead near the top of the can)



- Item 18: Jerrycans
 - 18B: POP (Performance Oriented Packaging) plastic
 - Same as for DOT 5L (Metal) except these containers may be palletized with hazardous material inside and a 2% ullage must be maintained to prevent expansion and leakage when filling this container

POP Plastic



DOT 5L Metal

- No tanker type vehicle is certified to be air-lifted full, with the exception of the M-149A2 water buffalo (only when potable water not readily available at destination)
- Diesel tankers will be drained
- Mogas tankers will be drained and purged





- Item 19 Dimensions
 - Ensure equipment will negotiate the aircraft ramps and interior dimensions (will not come into contact with the aircraft sidewalls or ceiling at any time)



Item 20 - Center of Balance - to nearest whole inch (Marked on both sides of vehicle)

Item 21 - Scale/Gross Weight - to nearest whole pound (Marked on both sides of vehicle)



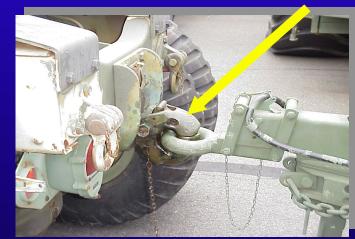
Item 22 - Axle Weights (Marked on both sides of vehicle)

 Mark axle weights above each axle

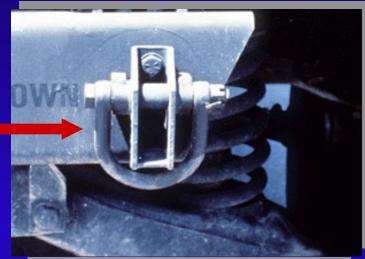


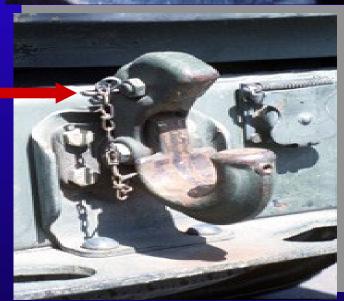
- Item 23 Tiedown Points (Serviceable)
- Ensure all clevises and tie down points are serviceable
- Include interior and exterior cargo restraint tiedowns in the inspection





- Item 24 Pintle Hooks/Clevises
 - Item 24a Serviceable (ensure all devices required for loading/off-loading trailers and cargo are serviceable)
 - Item 24b Safety Pin Attached (Ensure all required pins or cotter keys are properly attached and serviceable)





Item 25 - Vehicle **Equipment Secured: Ensure** all vehicle accessories are secure, including fire extinguishers, seat brackets, and any other loose equipment that may become a projectile during flight



DD Form 2133 - Section B: Vehicles / Non-Powered Equipment (cont)

Item 26 - Tire Pressure ensure within manufacturer specifications (Max 100 psi). Tires must be sufficiently inflated to prevent wheel-rim contact with the aircraft floor. Note that tires are not to be deflated to aid in clearance for loading on board aircraft



- Item 27 Shoring (Rolling, Parking, Sleeper, Special, Approach)
 - Check that all required shoring is serviceable and immediately available for use
 - Ensure shoring is adequate for the intended task (consult aircraft loading manual)



- Item 28 Accompanying Load
 - Item 28a Within Vehicle
 - Rated Capacity (do not exceed cross-country capacity) - see vehicle data plate



- Item 28b Secure To Vehicle
- Ensure cargo is properly restrained and within the loading criteria for the vehicle (generally not to exceed sidewall height)
- Use a minimum of 1/2 inch diameter rope (not nylon it stretches) for cargo restraint. 463L aircraft tiedown equipment may also be used
- Ensure rope touches cargo not just side racks
- Consider all locally manufactured modifications as

secondary loads

- Item 29 LOX/Nitrogen Cart
 - Ensure appropriate vent kit materials are with the cart
 - Ensure a technician is available at loading to install vent



DD Form 2133 - Section C: Pallets/Pallets Trains



DD Form 2133 - Section C: Pallets/Pallets Trains

- Item 30 Clean: clean each pallet and piece or equipment of all grime, oil, dirt etc - steam clean if necessary. Ensure no soil is transported on or under items loaded on the pallet
- Item 31 Pallet Scale Weight (to the nearest pound): attached to one 88-inch side and one 108-inch side of the pallet
- Item 32 Dimensions: Check that each pallet does not exceed the dimensions of the planned aircraft position (vary among aircraft and among pallet positions on a specified aircraft) - eg Pallet Position 6 on a C-130 may not exceed 76 inches in height

DD Form 2133 - Section C: Pallets/Pallets Trains (cont)

- Item 33 Cargo Properly Secured
 - Item 33a Netted (nets serviceable and properly installed)
 - Item 33b Chained/Strapped (serviceable and properly installed and provide adequate restraint)





<u>DD Form 2133 - Section C: Pallets/Pallets Trains</u> (cont)

- Item 34 Dunnage (3 Pieces Per Pallet)
 - Ensure three x 4"x 4" x 88" pieces accompany each pallet during shipment



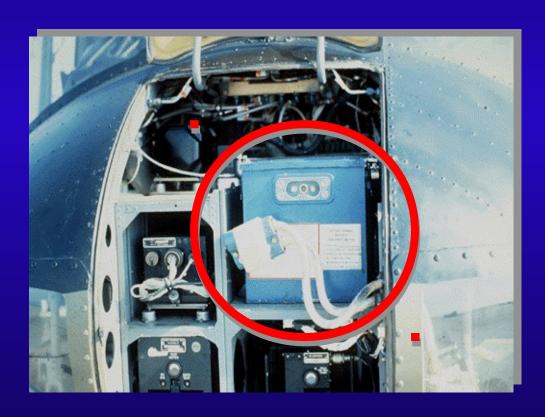


Item 35 – Fuel Quantity (Gallons)

 Do not exceed ¾ full or 150 gallons per tank whichever is less



Item 36 – Battery: Ensure user disconnects and tapes battery terminal and secures the battery to prevent accidental leaks and short circuits





Ref: FM 3-35.4, p.K-6

- Item 37 CB
 - Ensure user clearly marks the CB on both sides of the item

Item 38 - Scale/Gross Weight (Clearly marked on both sides)

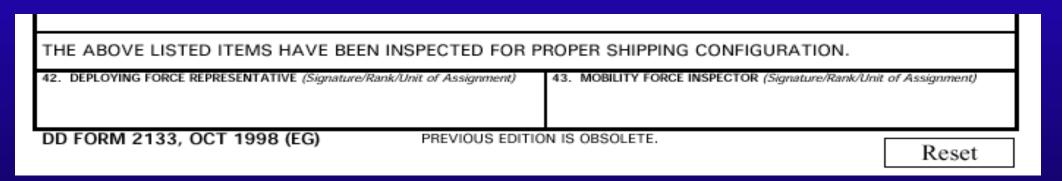


- Item 39 Shoring (Rolling, Parking, Approach)
 - Check that all required shoring is serviceable and immediately available for use
 - * Ensure adequate shoring is available to decrease the ramp angle to keep the helicopter from striking the ground or the aircraft



- Item 40 Special Loading Equipment
 - Be sure special equipment necessary to load this cargo is available (tools, jacks, pintle hooks, ramps, towbars etc)
- Item 41 Remarks
 - List and explain, in detail, any discrepancies found during the inspection and actions taken to correct the problem

- Item 42 Deploying Force Representative
 - Signed by the deploying unit representative accompanying the mobility force inspector
- Item 43 Mobility Force Representative
 - Signed by the CRE representative conducting the inspection







On Learning

QUESTION 1: What reference documents provide guidance for preparing an ARMY unit's HAZMAT for movement by air? Answer 1: TM 38-250, Preparing Hazardous Materials for Military Air Shipments, and the International Air Transport Association - Dangerous Goods Regulation

DETERMINE CENTER OF BALANCE







CARGO WEIGHING



- All cargo offered for shipment must be weighed
 - Portable or fixed scales
 - Indicate actual weight on both sides of items offered for shipment
 - Scale weight must be recorded on all copies of the manifest
- Accuracy of weights
 - Don't weigh cargo until secondary load is secured
 - Don't add or remove cargo
 - Any additions/deletions require cargo to be weighed again





TYPES OF SCALES

Fixed Scales

- Permanently installed weighing devices
- These scales are capable of weighing most items of cargo
- Located at most major military installations



Portable scales

- Most commonly used have a capacity of 20,000 lbs per scale
- Normally used in multiples of four (minimum is two)
- Used extensively at airfields, marshaling areas and inspection areas



USING PORTABLE SCALES - VEHICLES

- When only two portable scales are available:
 - Place the scales in front of the tires of the first axle
 - Drive the vehicle onto the scales; keep tires centered on the scales
 - Determine the axle weight note each scale weight (right and left side) must be combined to obtain the axle weight
 - Continue process until all axles are weighed

The driver and/or passengers must be out of the vehicle

prior to weighing

USING PORTABLE SCALES - PALLETS

- Weighing pallets
 - Each 463L pallet must be weighed
 - Scale weights must be recorded on all copies of the manifest
 - Place a loaded pallet evenly on two portable scales (three pieces of dunnage must be weighed with the pallet)
 - Add the two scale weights together to get the pallet gross weight
 - Ensure the scale weight is is clearly marked on one 88inch side and one 108-inch side of the pallet

Wheeled Vehicle Measurement



Center of Balance Terminology

- **CB** CENTER OF BALANCE the point of balance of a piece of cargo
- FAW = FRONT/FORWARD AXLE WEIGHT (pounds)
- IAW = INTERMEDIATE AXLE WEIGHT (pounds)
- RAW= REAR AXLE WEIGHT (pounds)
- **GW** = GROSS WEIGHT (pounds) (the total weight of an item of cargo, including all secondary loads found by adding all individual axle weights together)
- **RDL** = REFERENCE DATUM LINE (point from which all measurements are taken normally the forward edge of a vehicle).
- **MOMENT** Product (inch-pounds) obtained by multiplying the weight (axle) by a distance, (inches) from the RDL.

Center of Balance Terminology (cont)

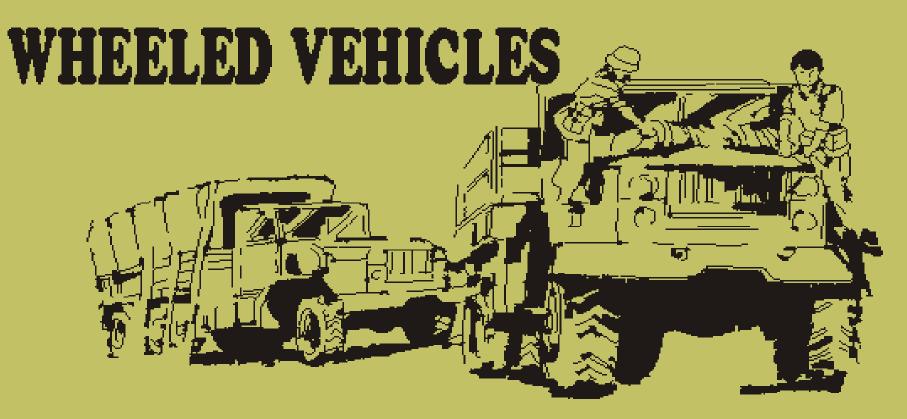
- FOH = FRONT OVERHANG (Distance in inches from front edge [bumper] to center of front axle)
- **WB** = WHEEL BASE (Distance in inches from center of front axle to center of rear axle or center of tandem axles)
- FFE = FROM FORWARD EDGE (Distance in inches from the most forward edge of a vehicle to its CB)

Center of Balance Criteria

- Center of balance markings are not required on individual 463L pallets (if built correctly CB will be at or near the center - however, CB marking required for married pallets [pallet train])
- Mark the CB on all items of cargo that meet the following criteria
 - All vehicles
 - Any items of cargo 10 feet or longer
 - Any item with a CB point other than its center

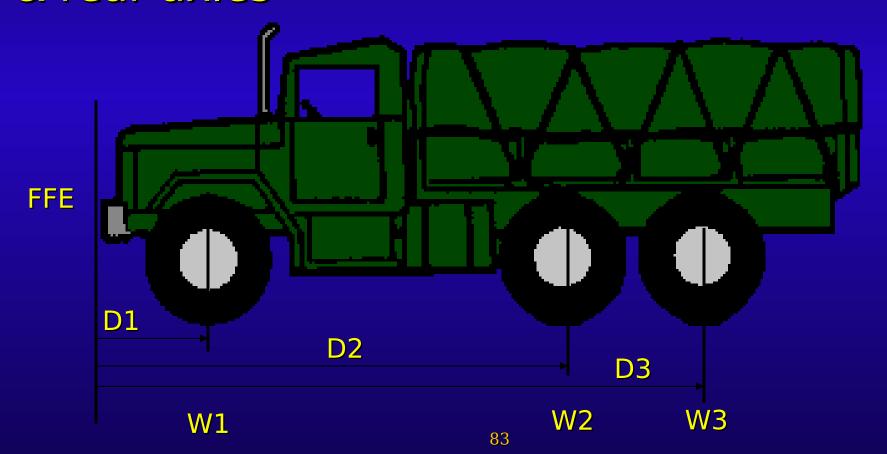


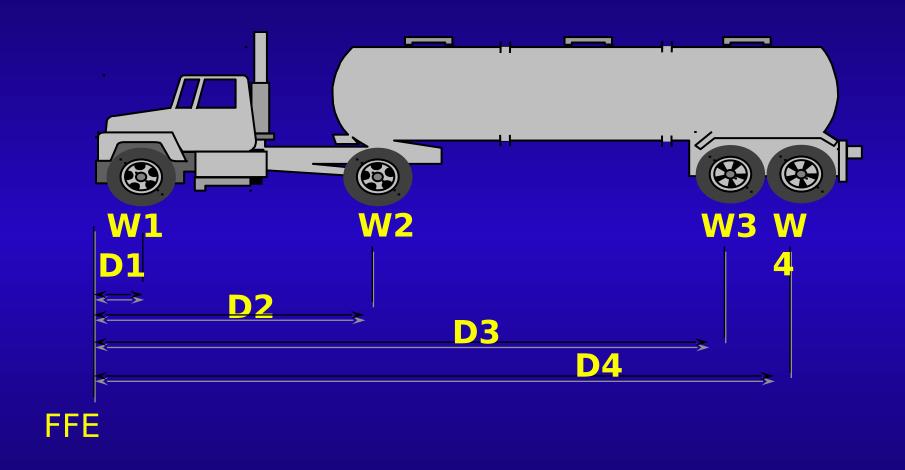
CENTER OF BALANCE OF



Wheeled Vehicles CB

 Determine distance from front forward edge (FFE) to the middle of the front, intermediate & rear axles





 Only vehicles that require a combined CB are those tractor-trailers that will remain coupled during flight



Ref: FM 3-35.4, p.K-5

```
W1= Front axle weight in pounds
W2 = Intermediate axle weight
W3= Rear axle weight
D1= Distance in inches, from FFE to Front axle
D2= Distance from FFE to Intermediate axle
D3= Distance from FFE to Rear axle
Gross Weight = Sum of W1, W2, W3 etc (sum of
all axle weights)
```

$$\begin{array}{c} \textbf{CB} = (\text{W1} \times \text{D1}) + (\text{W2} \, \square \, \text{D2}) + (\text{W3} \, \square \, \text{D3}) \\ & \text{GROSS WEIGHT} \\ & \text{(rounded to the nearest inch)} \end{array}$$

```
W1 = 5,000 lbs
  W2 = 5,000 lbs
                        FFE
      W3 = 5,000 lbs
                          D1
 D1 = 35 inches
                                  D2
                                      D3
     D2 = 131 inches
                              W1
                                        W2
                                            W3
         D3 = 177 inches
```

```
CB = (W1 \times D1) + (W2 \square D2) + (W3 \square D3)
CB = (5,000 \, \mathbb{I} \, 35) + (5,000 \, \mathbb{I} \, 131) + (5,000 \, \mathbb{I} \, 177)
CB = 175,000 + 655,000 + 885,000
1,715,000
                     15,000
                                                       15,000
CB = 114.33 or 114 inches (rounded to nearest inch)
```

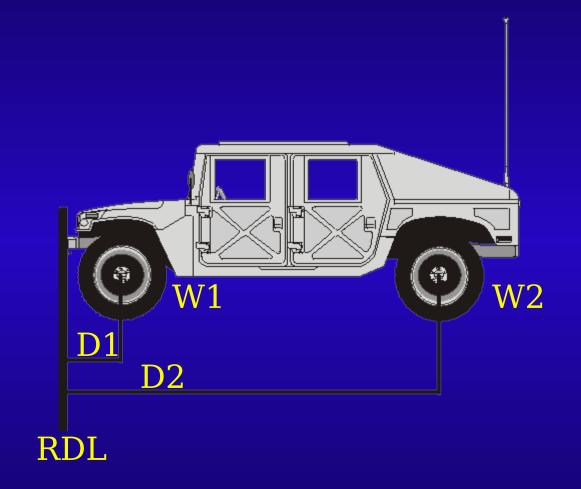
Sample Problem 1

D1 = 20

D2 = 150

W1 = 2,870

W2 = 2,550

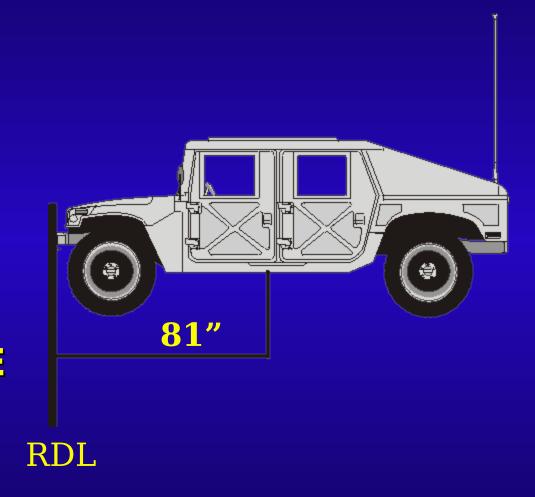


Sample Problem 1 Solution

 $20 \times 2,870 = 57,400$

 $150 \times 2,550 = 382,500$

 $\frac{439,900}{5,420}$ = **81** C/B FFE



Sample Problem 2

D1 = 70

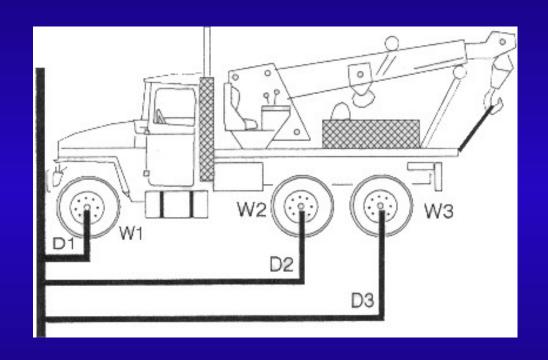
D2 = 222

D3 = 276

W1 = 12,500

W2 = 12,900

W3 = 12,700



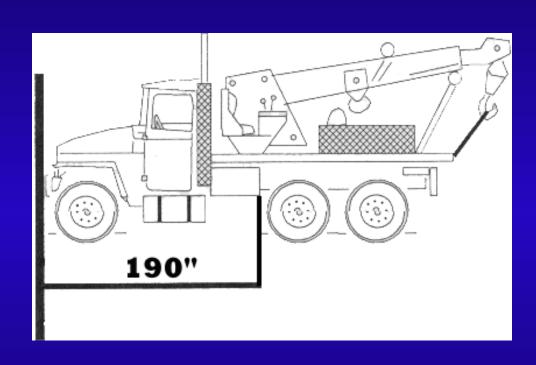
Sample Problem 2 Solution

 $70 \times 12,500 = 875,000$

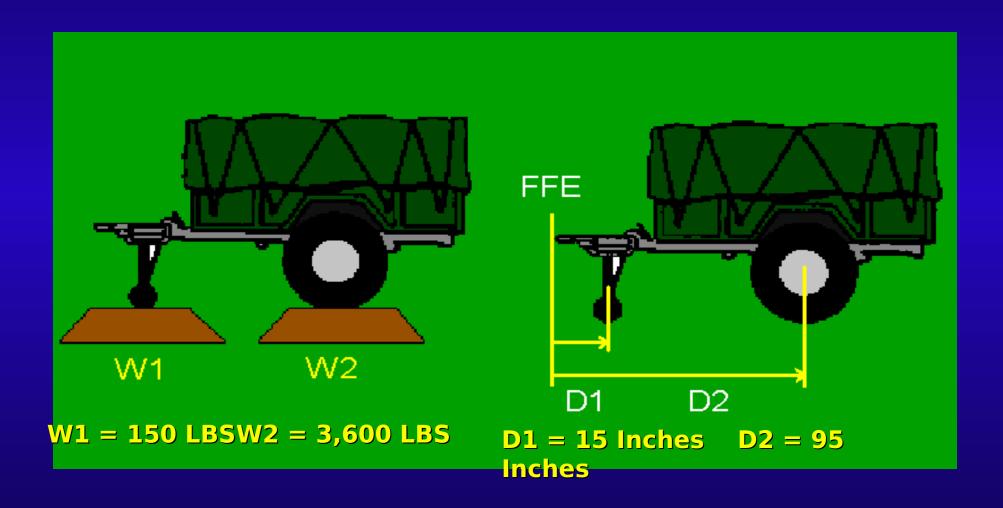
 $222 \times 12,900 = 2,863,800$

 $276 \times 12,700 = 3,505,200$

 $\frac{7,244,00}{38,100}$ = 190 C/B FFE



Trailer CB



Trailer CB (cont)

$$CB = (W1 \square D1) + (W2 \square D2)$$

$$GW$$

$$CB = (150 \ 15) + (3,600 \ 95)$$

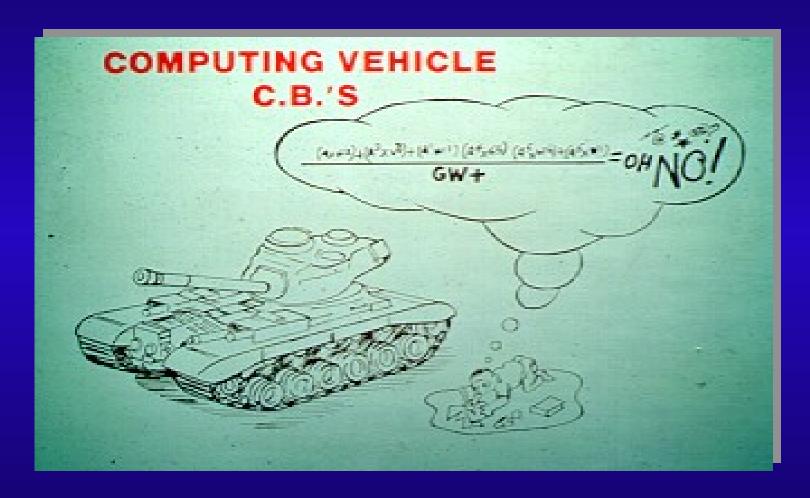
3,750

$$CB = 2250 + 342,000$$

3,750

$$CB = 91.8 \text{ or } 92 \text{ Inches}$$

Tracked Vehicles CB



How do you determine the individual axle weights?

Tracked Vehicles CB (cont)

To determine the center of balance for a tracked vehicle, drive the vehicle over an object large enough to allow the vehicle to teeter

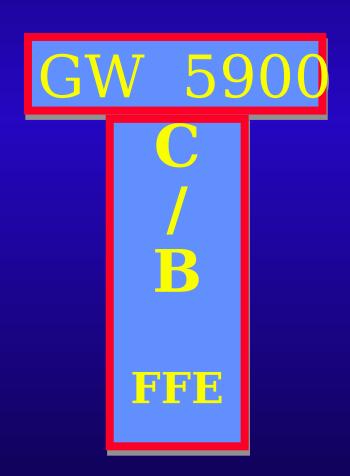
The location of where the vehicle teeters will be marked as the center of balance





Center of Balance Marking

- After computing the CB of the vehicle:
 - Mark its location and gross weight on both sides of the vehicle
 - Using weather resistant masking tape and grease pencil/magic marker, forming the letter "T"

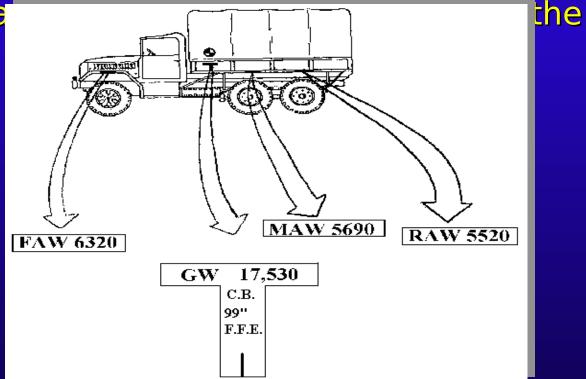


Center of Balance Marking (cont)

- "T" marking
 - The horizontal portion of the "T" will contain the gross weight
 - The vertical portion indicates the exact position of CB (indicated by the letter 'CB'

Indicate number of inches from the RDL to the CB location

and mark axle weights a vehicle



Center of Balance Marking (cont)



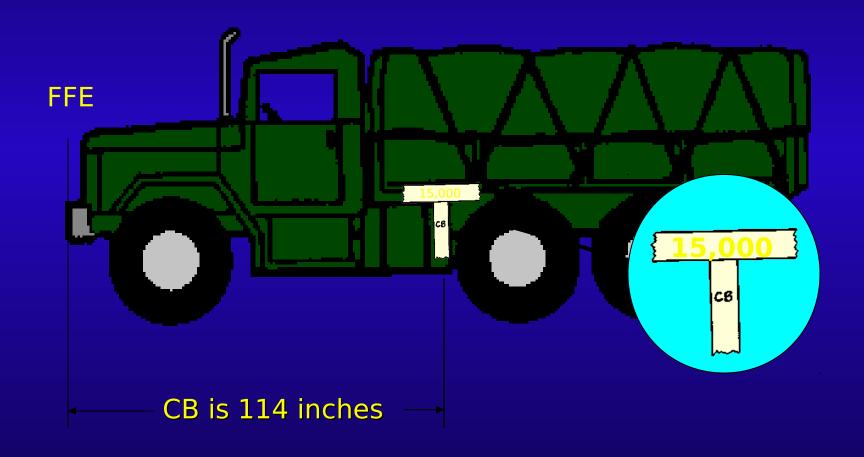
- Equipment that has a cargo carrying capability will
 - Be marked as an empty CB
 - Marked as a loaded CB
- Trucks and towed equipment transported coupled will have an individual CB on reach item (allows them to be disconnected and shipped on separate aircraft)
- Items not weighed or marked correctly will not be accepted for shipment

<u>Center of Balance Marker - Trailer</u>



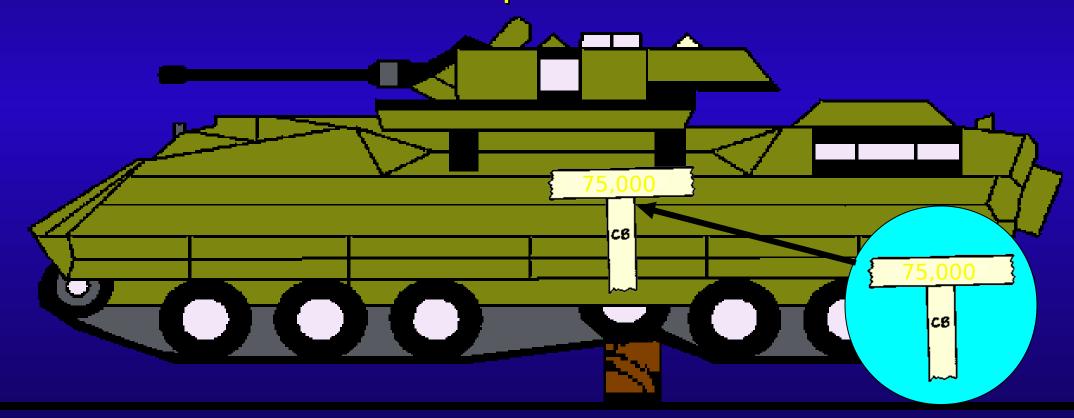
CB is 92 inches from FFE

Center of Balance Marker - Truck



<u>Center of Balance Marker - Tracked</u> <u>Vehicles</u>

Mark CB at balance point







On Learning

QUESTION 1: What part of a vehicle is normally used as a reference point for computing the center of balance?

Answer 1: The front forward edge (FFE) of the vehicle or equipment.



On Learning

QUESTION 2: What are two pieces of information needed to calculate a vehicle's center of balance?

Answer 2: The distance (in inches) from the front forward edge of the vehicle to each axle, and the weight of each axle.



On Learning

QUESTION 3: What are the criteria for determining if a vehicle or cargo item must have its CB and gross weight identified? Answer 3: Cargo items 10 feet or longer and items with centers of balance other than in the physical center of the item, must have their gross weight and CB identified.



QUESTION 4: After a vehicle's CB is determined, how is it marked on the vehicle?

Answer 4: Tape is placed on the vehicle at the location of the CB in the shape of a "T". "CB" is written on the vertical portion of the tape and the vehicles gross weight is written in the "T" cross bar.

Summary

- Initial Planning
- Personnel
- Equipment Preparation and Joint Inspection
- Center of Balance



